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Title: Dental Therapists in General Dental Practice. A literature review and case study analysis to determine what works, why, how and in what circumstances.

Emma Barnes,¹ Alison Bullock,¹ Ivor G. Chestnutt,² Jonathan Cowpe,² Kirstie Moons,³ Wendy Warren.⁴

¹Cardiff Unit for Research and Evaluation in Medical and Dental Education (CUREMeDE) Cardiff University

²Cardiff University School of Dentistry, College of Biomedical and Life Sciences

³The Dental Postgraduate Section, Health Education and Improvement Wales

⁴Aneurin Bevan University Health Board

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MS. EMMA BARNES (Orcid ID : 0000-0001-6447-6647)

PROF. ALISON BULLOCK (Orcid ID : 0000-0003-3800-2186)

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Corresponding author mail id :BarnesEJ@cf.ac.uk

Abstract

Introduction

In the United Kingdom, policy and guidance changes regarding the role of Dental Therapists (DTs) were implemented in recent years with a view to changing dental care to a more preventive-focussed, teamwork approach. However, success in the adoption of this model of working has been varied.

Aims

Adopting a realist approach, our aim was, to examine the use of DTs in general dental practices in Wales, exploring what works, why, how and in what circumstances.

Materials and Methods

The research comprised two stages. (i) A structured literature search, dual-coding papers for high-level factors describing the conditions or context(s) under which the mechanisms operated to produce outcomes. From this, we derived theories about how skill-mix operates in the general dental service. (ii) Six case studies of general dental practices (three with a Dental Therapist/three without a Dental Therapist) employing a range of skill-mix models incorporating semi-structured interviews with all team members. We used the case studies/interviews to explore and refine the theories derived from the literature.

Results

Eighty-four papers were coded. From this coding, we identified seven theories which reflected factors influencing general dental practices within three broad contexts: the dental practice as a

business, as a healthcare provider, and as a workplace. We tested these theories in interviews with 38 dental team members across the six care studies. As a result, we amended five of the theories.

Conclusion

Our analysis provides theory about outcomes that DTs may facilitate and the mechanisms that may assist the work of DTs within different contexts of general dental practice.

Introduction

The mix of skills in the dental workforce has been much debated.⁽¹⁾ In developed countries, the majority of dentistry practiced is not complex; much of the work of general dental practitioners (GDPs) relates to routine examinations⁽²⁾ and simple maintenance.^(3, 4) Improving population health suggests that dental examinations with little or no further treatment need will increase with time.⁽⁵⁾ Improvements in oral health and reductions in the prevalence of dental caries and periodontal disease⁽³⁾ mean that while children and adults may require minimal intervention. However, an increasing population of older patients will retain their dentition for longer⁽⁶⁾ and for a number of decades to come, will present with complex treatment needs.⁽⁴⁾ Workforce planning needs to meet these changing patient demographics and the future need for care.^(3, 7, 8)

Recent years show dental workforce supply in England is insufficient to meet patient demand⁽⁶⁾ and many dentists feeling overworked.⁽⁹⁾ One approach to managing this shortfall is to adopt a team approach to patient care. As only a small portion of dental treatment is complex, the 1993 Nuffield Report recommended that dental practices could be staffed with more auxiliaries/dental care practitioners (DCPs).⁽¹⁰⁾ DCPs' scope of practice was extended in 2013 in the UK,⁽¹¹⁾ and up to 75% of clinical time is estimated to be spent on work that could be completed by a DCP.⁽¹²⁾ Dental Therapists and dual-qualified Dental Hygienists-Therapists (DTs) are mid-level DCPs in the UK with a wide scope of practice. Educated to either diploma or degree-level, these GDC-registered professionals are trained to carry out a range of activities that fall short of the more complex work within the dentist's scope of practice. Their remit is similar to Dental Hygienists in that it includes

many aspects of preventive oral health care and periodontal treatments. However, unlike dental hygienists, DTs in the UK are also able to carry out simple restorations in both primary and secondary teeth, and carry out pulpotomies or extractions on primary teeth.(11) The introduction of Direct Access(13) legislation in the UK was intended to facilitate access of patients by allowing trained and competent dental hygienists and DTs to diagnose, treatment plan, and carry out treatments within their scope of practice(11) without a dentist's prescription. In Wales, Welsh Government's Prudent Healthcare (14, 15) approach also emphasises the adoption of teamwork and encouraging dental teamwork remains on their agenda.(16)

There is considerable scope to delegate routine examinations and restorations to DTs.(17, 18) Research found that 35% of restorative interventions were duties that could be provided DTs, accounting for 43% of clinical time, while delegation of diagnostic and treatment planning work would account for 70% of patient visits and 58% of clinical time.(17) When staff '*only do what only they can do*', the skill-mix of that team is said to be optimised.(15) Workforce modelling in the UK suggests that in a 'maximum skill-mix model', if all clinical tasks within DTs scope of practice and half of restorations and radiographs were delegated, the service would require 30% fewer dentists but 10 times more DTs than are currently registered.(12)

As well as lessening demand on dentists' clinical time, reviews in the UK and the USA conclude that DTs in the dental team improve patient access.(19, 20) However, in Wales and the rest of the UK, current National Health Service (NHS) regulations linking funding to a dentist with a performer number mean that only those seeing patients privately or working in the community dental service are able to benefit from Direct Access arrangements. Thus DTs completing private appointments are more readily able to work to their full scope of practice.(21) In addition, DTs are reported to be underemployed,(22) with a high rate of part-time working.

Although drivers have promoted acceptance of greater use of DTs in oral healthcare, skill-mix developments in dentistry have been slow to progress.(23, 24) Drawing upon a realist approach,(25) our aim was to examine the use of DTs in general dental practices, exploring what works, why, how and in what circumstances. We explore contextual factors within which skill-mix occurs in the general dental practice in the UK, how teamwork is implemented and the outcomes of teamwork.

Materials and methods

We adopted a realist approach in our evaluation.(25) The theories were derived from a realist review of the literature and refined based on qualitative data gathered from case studies of general dental practices and semi-structured interviews with dental team members. Realist evaluation is an

established method in healthcare practice research, particularly for investigating the real-life implementation of interventions, guidelines, or protocols.(26-30) The purpose of realist evaluation is to find out why interventions work differently across different contexts,(31, 32) moving beyond a descriptive account to uncover deeper causal factors.(33) The aim of this evaluation was to explore: “does it work, for whom, when and why?” where “it” refers to the implementation of a teamwork approach to patient oral health care that uses team members’ full scope of practice.

Initial coding and theory development

We undertook a structured review of the literature published post the 1993 Nuffield report.(10) Databases were searched using key words (see Figure 1).

We coded papers for high-level factors describing the conditions or context (C) under which the mechanisms (M) operate to produce desired outcomes (O) (i.e. teamwork).(25) Context refers to ‘social and cultural conditions’(25) where interaction takes place(34) and which may, or may not, influence mechanisms. In this initial coding, we coded wider external context factors (eC) (pre-existing factors outside the dentist’s control) and internal context factors (iC) (factors within the dental practice). Rather than simply an intervention or activity, mechanisms are intended to generate change,(35) and can cause an intervention or activity to work, or not.(34) In our study, the mechanisms of interest related to factors around teamwork and delegation of treatment to dental therapists (DTs), as part of patient oral care. The acronym CMO (context-mechanism-outcome) is used to describe these features, where C refers both to eC and iC.(25)

Papers were distributed to three members of the research team for coding. Each paper was coded by at least two team members and all final coding decisions discussed and agreed. A preliminary list of codes and an analysis framework was developed by the research team and refined following discussion of subsequent coding. UK-based research papers were coded first to provide a grounding in the British context factors, followed by research papers from the rest of the world. The conclusions of UK-based and worldwide systematic reviews and discussion papers (post-2005 NHS contract change(36)) were coded using the same procedure and recorded on a separate grid. This coding was cross-compared and verified with the coding of the research papers. The results of the coding were summarised in narrative form. These narratives provide a summary of the mechanisms of skill-mix implementation and the resulting outcomes derived from our analysis of the literature. These narratives were further distilled via research team discussion to create a statement or theory of what facilitates or hinders how skill-mix operates and its outcomes.

Case studies and theory refinement

To “test” the theories in a contemporary context, we undertook six case studies. We selected general dental practices in South Wales, purposively sampled, informed by the research team and Advisory Group’s knowledge of practices suitable for investigation. The practices were chosen because they were well-established and provided a significant proportion of treatments under the NHS. Together they operated different models of skill-mix; three employed a DT (with-DT), three did not (non-DT). At each site we conducted semi-structured interviews(37) with members of the dental teams, either individually or in small groups (n=38). The interview schedule drew on the outcomes of our analysis of the literature to ‘test out’ initial theories about CMO relationships in a “real life” setting and provided new insights.(37) Open questions also allowed participants to describe unanticipated influences or factors. All interviews were transcribed and coded using the CMO analytic framework. We then reviewed and amended our summary theories (of what works, how, and its outcomes) from the literature analysis in light of the case study interviews.

Results

Initial coding and theory development

Eighty-four papers were coded in total. Of these, there were 34 UK-based research papers, 25 research papers from elsewhere, 12 UK-based systematic reviews (n=3) or discussion papers (n=9) and 13 (post-2005) worldwide systematic reviews (n=4) or discussion papers (n=9).

Influencing/CMO Factors identified

In brief, factors identified in the literature in the wider external context (C) included: treatment need (an ageing dentate population with complex needs and a parallel younger population with improving oral health requiring less complex care),(3, 4, 6, 12) workforce supply and a demand for dental treatment that exceeds capacity,(6, 9, 12, 38) DTs scope of practice and regulation(2, 39-44) and funding systems.(1, 23, 40, 45, 46) Context factors internal to the practice (C) included: dentists’ understanding of DTs’ role and scope of practice(9, 47-49), confidence in DTs’ work,(43, 48, 50) dentists’ attitude to delegation(9, 44, 45, 48, 49, 51), surgery space(4, 49, 50, 52, 53) and availability of suitable varied cases for DTs within the practice patient demographics.

Mechanisms (M) included: an established referral system,(24, 38, 44) team training(2, 4), a payment system that supports DTs’ employment,(1, 3, 23, 45, 46, 49, 50, 54) good team communication and a

workplace culture that values teamwork.(38, 44) We coded outcomes at the practice level (O) which included: DTs undertaking diverse work and freeing the dentist to complete more complex cases,(44, 55) enhanced job satisfaction,(20, 22, 44, 56) patient satisfaction with their care(2, 19, 20, 57, 58) and increased practice productivity(12, 17). Wider system outcomes included: evidence of patients having improved dental access,(19, 20, 59-61) patients having their oral health needs met, population oral health improvements, (61, 62) a system that puts greater emphasis on prevention and system efficiency savings(20, 63, 64) (summarised in table 1).

Based on a full narrative summary of these factors we posited seven theories on how the interactions between the contexts and mechanisms identified may be influencing skill-mix in general dental practices in the UK, and some of the outcomes that may arise for the practice and the patients (Column1, Table 2). The theories are situated within the three wider contexts that emerged from the summaries as reflecting and influencing different aspects of activity within general dental practices. These were the dental practice as a business, the dental practice as a healthcare provider, and the dental practice as a workplace

Case studies and theory refinement

Thirty-eight dental team members were interviewed across the six sites (7 principal dentists, 5 associates, 1 trainee, 4 dental therapists (DTs), 13 dental nurses, 5 practice managers, 1 dental hygienist and 2 receptionists. A profile of the total staffing in each site is given in Table 3. All practices reported treating a variety of patients. All practices saw a range of ages and a variety of socio-economic groups with high treatment demand. One practice was in a semi-rural location (non-DT), all others were based in small towns; another practice (non-DT), was part of a corporate chain while others were independent practices. Within the UK, general dental practices typically offer a blend of NHS and private work; across the case study sites, the proportion of NHS treatment ranged from 46-100% According to a record of appointments completed during the data collection period, overall, 83% were for NHS patients (21).

The theories were refined in light of the case study data (Column 2, Table 2). We provide a summary of each theory. All literature cited is UK-based, unless noted as otherwise.

The Dental Practice as a business

General dental practices in the UK operate as businesses and dissonance between dentistry as a business and as a healthcare profession has been noted.(40) The business case is shaped by the

commissioning framework and local context of each dental practice.(4) One conclusion from the literature was that insufficient attention had been given to devising a funding mechanism to support and encourage team-working.(1) From our literature analysis, we posited the theory *“A payment system focused on prevention (eC) supports employment of DTs (O) by facilitating the business case (M).”*

The financial implications of employing a DT within their team was an important factor for dentists in the case studies. The Welsh NHS funding system was widely reported as a barrier to employing a DT as they cannot directly contribute to units of dental activity (UDAs) (how payment for treatment is calculated in Wales and England; differing systems operate in Scotland and Northern Ireland) and UDAs do not appropriately remunerate prevention work. One non-DT practice had previously employed a DT when Welsh NHS was piloting a different funding model from that which relates to the majority of dental practices. Despite favourable experiences, they discontinued employment when the pilot contract ended (*“If the contract was going to go down the route of the pilot, 100% every practice would benefit from having a therapist.”* Practice manager1). In this practice, dentists that delegated to the DT contributed to their pay according to how much they used them. However, this arrangement was off-putting for an associate (*“The principal dentist used them a lot. Whereas I would have had to pay for them so I didn’t. Because of the payments it worked out easier for me to do everything myself.”* Associate 1). This dental practice enhanced their skill-mix by employing dental nurses with extended duties. In with-DT practices, all spoke of the different ways they covered the DT’s salary. Most were paid hourly, and they acknowledged that they provided care at a lower cost than a dentist (*“You’re paid hourly at a cheaper rate [than a dentist] as well. So you’re still carrying out the work that needs to be done, but ... at a cheaper cost.”* DT3). In all case studies, NHS contract requirements and remuneration models were quoted as a barrier to using a DT (*“Dentists say ‘we can’t make money from having a therapist’”* DT1). To make it work, practices needed to be creative and sometimes relied on DTs providing a mix of NHS and private work. Only having a DT in the practice part-time was a barrier to optimised teamwork (*“I’ll take the time to explain to the patients why they’re going to [DT] and then I find they’re booked back in with me, just because I’ve got a space earlier.”* Associate 2).

Based on the case studies, we posited an amendment to the original theory: *“In practices with a sufficient number of suitable, varied cases for DTs (iC), establishing a practice-appropriate, innovative payment system (M) supports full-time employment of DTs (O).”*

The Dental Practice as a healthcare provider

Trust and confidence

While the business case of a practice is key to including a DT on the team, the provision of oral healthcare is its primary function. Dentists' lack of confidence in DTs' training and the quality and safety of their work has been reported.(43) In the literature, it is acknowledged that education providers need to adapt in line with the evolving skill-mix requirements of the workforce.(1) Issues around dentists' confidence in the quality and safety of DTs' work led to the theory: *"Ensuring therapists are appropriately trained (M) enhances trust, confidence and patient safety (O)."*

The interviews suggested DT personality and motivation were factors influencing others' confidence in their work but that the experience of actually working with a DT was key to developing trust and confidence. Team training and induction was discussed as a way of ensuring safe practice. Therefore, we proposed an amendment to this theory: *"Whole team training (M) enhances trust, confidence and patient safety (O)"*. Additionally, we suggested: *"Experience of working with DTs (M) enhances dentists' trust and confidence in their work (O)"*.

Valuing teamwork

Under-delegation of work within the DTs' full scope of practice has been reported,(47) which can lead to concerns about de-skilling.(65) As identified in the previous section, lack of knowledge about DTs contribution to practice (9, 47) or expectations that they would spend most of their time completing hygiene work(49) have been noted. Here, lack of knowledge may influence how DTs are utilised and valued within the team. Our analysis of the literature led us to propose: *"A workplace culture that understands and values teamwork (M) improves commitment to teamwork in providing oral health care (O)"*

The practices with no-DT reported high levels of cooperation. Dental nurses rotated tasks and changed which dentist they worked with at regular intervals. They reported that this kept the role interesting and ensured they could carry out a range of duties as needed. Regular practice meetings and a workplace culture open to suggestions were reported. They highlighted the importance of good communication, particularly with part-time staff. The non-DT practices supplemented their salaried associate dentists with new graduates (grant-funded dental foundation trainees). Some practices with-DTs rotated their dental nurses' roles; others operated a model which assigned Dental nurses to specific dentists/DTs, matching ways of working and personalities to avoid conflict. Disruption from unexpected staff changes and the difficulties of working part-time in a large practice were noted as barriers teamwork.

The two non-DT practices who had not worked with a DT previously, while acknowledging the potential value of a DT, confessed to not knowing how their role would work and expressed concern over initial disruption in routine (*"It's just you tend to get stuck in your ways. It's the worry that if we did have a therapist how would it fit in? How would it work?"* Principal dentist 1). In practices with-DTs, some DTs felt that their roles were not widely understood (*"I would say probably educate them [dentists] - what the therapists are able to do, because I think they would be quite shocked. A lot of dentists think that therapists [only] see children and that's not the case."* DT2).

The with-DT practices operated different models of teamwork. In one, the DT worked half the week alongside several ADs and completed less complex work to ease the dentist caseload (*"We tend to favour sending the chronic perio treatment to them which will help ease up our appointment books."* Associate 2). In another, with two DTs working part-time alongside the dentist and one part-time associate, DTs were considered the first-line of patient-care with the aim of freeing the dentist to complete the more complex work only s/he could perform (*"They're professional people in their own right. I've allowed them to do as much as they can within their scope."* Principal dentist 2). In the third practice, the DT worked part-time alongside several dentists. In this practice, certain tasks were automatically referred to the DT (e.g. *"my restorative work goes to the therapist"* PD3). In the latter two practices, having an embedded system of referral within the practice countered dentist's preferences, ensured DTs received a range of cases and provided a predictable routine of care for patients (*"All the remit that DTs are allowed to do they do in this practice, and that leaves me then to do some of the more advanced stuff in the practice, and the patients understand that".* Principal dentist 2).

Embedding referral to DTs within a practice and fostering trust between staff members also means that the practice develops a shared culture of teamwork. The theory *"A workplace culture that understands and values teamwork (M) improves commitment to teamwork in providing oral health care (O)"* initially referred to DTs' contribution but the case studies with no-DT also typified workplaces with a strong shared team approach. The with-DT practices provided a teamwork approach to patient care through multi-professional skill-mix however one of the non-DT practices used a DN with extended duties, and all used role rotation or an informal system of helping each other to complete tasks. Therefore, the original theory was supported in the case studies but was too general for our programme theory; while workplace culture underpins successful teamwork, other factors influence the successful inclusion of DTs in a dental team. We amended the theory to: *"Establishing a regulatory-appropriate referral system (M) within a workplace culture that understands and values teamwork (M) improves commitment to teamwork in providing oral health care (O)."*

Direct Access and regulatory factors

A workplace culture that values teamwork and the DT role was also said to be particularly important for DTs providing Direct Access.(44) The standards and guidance on Direct Access were introduced to provide greater access to dental hygienists and DTs and when used there is some evidence of improved patient access and patient satisfaction.(42) However, while DTs report more positive views(44) of Direct Access, dentists' opinion has been mixed.(43) NHS contract restrictions currently restricts optimum Direct Access use; other noted barriers to wider use include Scope of Practice restrictions, patient safety concerns, logistics and teamwork.(43, 44) We posited the theory *"The regulatory context (C) aligned with guidance and policy drivers (M) enables enhanced skill-mix in the general dental service (O)"*

Non-DT practices were unsure how Direct Access would benefit practice. Attention was drawn to limitations of DTs' scope of practice (e.g. diagnosis and reporting x-rays) and concern was expressed that DTs might miss some treatment needs. Another highlighted the perception that Direct Access could be a foreign concept for patients, who would not fully understand the role of DTs and would seek out dentists rather than DTs if they had a treatment need.

Professionals in with-DT practices also showed some uncertainty about Direct Access. Again, some were unable to see the benefit to patient care and felt that seeing a dentist first was the best approach. However, experienced DTs were seen as capable of making clinical decisions and while some individuals did not support Direct Access, they agreed that restrictions on changing treatment plans should be removed. In this practice, the DT also preferred working to a dentist's treatment plan, knowing what to expect in the appointment and how they can help the patient (*"If someone has been seen at check-up, you look at your notes. You can read something that's already been worded well. You know what you're seeing. So you know what to expect."* DT3). In one practice, staff were more supportive of Direct Access and DTs providing first-line care. One practice had previously used DTs for first-line screening of new patients. However, the practice had now reverted to a more traditional referred model which the dentist felt happier about. A dentist in one practice felt that a true Direct Access system in a practice of one dentist and three DTs would be the best way to manage periodontal care.

They commented on how wider NHS contract requirements and other regulations (e.g. prescription only medications/radiographs) impeded Direct Access and generally restricted DTs' use of full scope of practice (*"Prescriptions for things like toothpaste and mouth washes, we can't sign them. So we've got to wait for the dentist to sign them. We can't diagnose caries on our own, but we can take a drill and drill it out. It's absolutely ridiculous."* DT1). This was seen as creating unnecessary work for the

dentist (*"we've got to have check-up now with the scale and polish ... It's doubled the dentist's workload"* DT2). All DTs carried out a selection of Direct Access work privately, mostly hygiene tasks.

The case study results illustrate that opinion, from both dentists and DTs, and the regulatory and remuneration framework influence implementation of Direct Access guidance within NHS practices. Considering the case study findings, we suggest amending the theory to *"A regulatory context (C) aligned with guidance and policy drivers (M) and a whole team that values Direct Access enables enhanced access to DTs in the general dental service (O)"*

Teamwork benefits for patients

Access to services is an important factor in health inequality.(3) Reviews from the UK and USA concluded that inclusion of DTs in the dental team improved patient access, (19, 20, 59) particularly to underserved populations (e.g. younger and older patients)(3, 55) and helped reduce health inequalities in India and USA.(60, 61) Concerns were reported that patients may view delegation as a cost-cutting move, challenging trust.(58) However, negative patient opinion was not borne out in the literature. Conversely, the evidence indicated that patients seeing DTs reported higher satisfaction with their care.(2, 19, 20, 57) Reviews from the UK and USA concluded that DTs' contribution to dental teams helped improve dental health.(61, 62) Another international review highlighted the difficulty in separating the care provided by DTs from social factors such as the influence of self-care behaviours, water fluoridation and socio-economic status.(41) From this we distilled the following theories: *"Improving patient access and patient care (M) improves patient satisfaction with their care (O)"* and *"Improving patient access and patient care (M) improves patient oral health (I)"*

Improved patient access to care

Non-DT practices expected that changing their skill-mix would reduce workload pressure and free up dentists' time for more complex work or emergency care; this was partly confirmed by the practice which had participated in a contract-reform pilot although some team members reported that it had made little difference to workload. Responses from those working in with-DT practices also varied. Some stated that a DT did release dentists to do other, more complex work and the additional patients helped meet UDA targets. Others commented that in practice NHS contractual issues limited DTs use and created extra workload from unnecessary examinations.

Patient experiences

Patient opinion of DTs was a concern for some of those working in the non-DT practices. They suggested that patients would be reluctant to see a DT as they like to see their regular dentist. This

was thought to be particularly true for older patients although newer patients or those seeking emergency treatment were expected to be more flexible. Some also expressed concern that patients may view DTs as less competent. A non-DT practice with previous experience of working with a DT told us that patients could be initially reluctant to see a DT but were usually happy if informed by the dentist first. Problems with higher cancellations and viewing the DT as less important in the practice hierarchy were also suggested.

With-DT practices reported poor understanding of DTs' remit amongst patients, with dental hygienists being better understood and accepted initially. Again, information and establishing a good relationship with the DT, improved patient acceptance. Interviewees cited incidents of patients being cautious of being treated by DTs, but that they came to accept and value their contribution. Some team members explained that patient acceptance was aided by the referring dentist's explanation of the DT as a colleague rather than a subordinate and emphasising their expertise in certain clinical tasks. Appointment management could also enhance acceptance of care by a DT. Patients could be confused if they had an examination with a dentist then saw the DT for treatment. Ensuring that both appointments were on the same day were thought to ease this. DTs reported that they felt patients valued getting good dental care from the whole dental team. Some reported that patients, particularly private patients, preferred to see their "usual" dentist, viewing seeing other professionals, even another dentist, as an "inconsistency" in their care.

Oral health improvement

While we cannot directly determine any improvements in patient-centred oral health from our case studies, interviewees reported how the extra oral health education and time spent with patients led to noticeable oral health improvements, which was satisfying for both patients and the dental team.

Data from these case studies appear to support the two theories.

The Dental Practice as a workplace

The impact of changing teamwork and skill-mix on dental professionals is an issue that needs to be addressed. As manager of a multi-disciplinary team the dentist requires a significantly different set of leadership skills. Team-working and shifts in the division of labour has led to concern about what this means for the dentists' role.⁽⁴⁾ Such change may bring both benefits and challenges. As we have reported, by providing routine care to patients, DTs can release the dentist for more complex cases.^(44, 55) An additional benefit of delegation is time savings which enable dentists to practice at a higher level of expertise.⁽⁴⁴⁾ For DTs, performance of a wide variety of activities has been shown to be a predictor of job satisfaction.^(20, 56) Drawing upon the literature, we proposed the theories:

“Dentists adopting a leadership role (M) and ensuring DTs carrying out a varied workload, working to their full scope of practice (M) improves job satisfaction (O).”

Non-DT practice staff expected professional boundary issues for dentists where the work of others could be seen as “stepping on their toes”. Potential loss of work for ADs and the financial implications were raised (*“I don’t know how they [associates] would feel about it. I know if I was in that position I’d be... well that’s my job.”* Principal dentist 2).

With-DT practices also reported that ADs or newly qualified dentists were sometimes less willing to delegate tasks. Reasons included financial or regulatory concerns or new patients (*“I do feel like they’re my patients, that I have to take responsibility for the work.”* Associate 2). One DT noted, *“you need to be quite a confident person to work alongside the therapist”* (DT2). Dentists were said to be generally willing to delegate tasks, particularly if they are busy, (*“I think we’re so busy that they’re glad to [delegate], to be honest with you”* Practice manager 2) or knew that it would contribute to patient care (*“That’s the main thing - what we are doing for the patient, rather than who does it.”* Associate 3).

Most practitioners interviewed reported that a varied workload, at a complexity appropriate to their level of training, improved their job satisfaction. Variety was valued in both with-DT and non-DT practices and across professional roles as a way of keeping the work interesting. DTs explained how they valued contributing to a team approach to patient care, either by helping the dentist to complete a scheme of work (*“You feel as if you’ve helped [dentist], rather than just seeing to your own patients.”* DT1) or by working with a DN, something they may not do as a dental hygienist (*“I have worked in one practice without a nurse and it is miserable, but that was the conveyor belt of twenty-minute appointments that I was really keen to move out of.”* DT3).

Considering these results, we changed the theory to *“Team members carrying out a varied workload, appropriate to their level of training (M) improves job satisfaction (O).”*

Discussion

Workforce planning needs to meet changing patient demographics and future care needs.(7, 8) Our study provides information on factors influencing the use of teamwork to deliver patient oral care, and the consequential outcomes. Factors in the wider external context include patients’ treatment need, workforce and demand, and funding systems. Mechanisms influencing the uptake and implementation of a teamwork approach include dentists’ knowledge of DTs’ Scope of Practice, their opinion on delegation and confidence in DTs’ work, appropriate team training/experience, embedded referral systems and development of a workable business case to sustain employment of

DTs. Outcomes of optimised skill-mix included the need for professional identity renegotiation, improved job satisfaction, improved patient access and patient care.

We adopted a realist approach(25), uncovering factors influencing how teamwork currently 'works' according to the literature and using our case studies to reveal something about how it works in practice.(66) We then used these findings to propose theories about how it "should" work to optimise skill-mix. As Astbury(67) notes, we should not imply that the identified CMO relationships (our theories) are linear; complexity and multi-mechanism interactions should be recognised. Many of the empirical papers were self-report questionnaires, based on small samples. While each source should be approached critically, as a body of literature the overall conclusions can inform understanding. Our review focussed on the contribution of DTs to a teamwork approach to patient care. Their wider range of extended duties could, in theory, provide the broadest professional contribution to patient care. We acknowledge that in practice many DTs work in dual therapy/hygiene roles and therefore their work in practice may not be as clearly delineated. We also acknowledge that other DCPs make a great contribution to teamwork in general dental practice, and their roles may also be similarly under-utilised and therefore worthy of attention in future studies. Our reliance on interview data in this study limits our ability to comment on the potential outputs for patients.

Our study shows that different drivers for teamwork operate. The literature, case studies and resultant theories highlight contractual and regulatory issues which hinder skill-mix in general dental practice in Wales. Brocklehurst et al(3) highlighted the need to align the remuneration system to dental workforce practice. Currently our case studies showed diverse payment systems and working practices for DTs which may have implications for recruitment and retention.(54) Educational support to assist practices develop payment and working practices that would be acceptable to the whole team may help with this issue. Funding issues were a deterrent for one non-DT practice and were an ongoing concern for the with-DT practices who could only employ DTs on a part-time basis. Developing a practice-appropriate mix of NHS and private work is one way of establishing a workable business case. However, increasing preventive care on a largely private basis may not allow access to those unable to pay, i.e. those who may benefit most from it.

Direct Access guidelines, in Wales and the rest of the UK, were intended to ease access to, and streamline treatment by DTs. Similar policy exists in New Zealand(53) and in some states in Canada.(8) Direct Access allows DTs to work independently, and while this has been possible in Community Dental Services, the NHS contract still requires dentists to open and close all courses of treatment. This has stunted implementation in NHS-funded general dental practice. While some

practices have been able to put Direct Access into practice, it requires a creative approach to working. Direct Access was partly carried out on a private basis by the DTs in our case studies. Questions have also been raised about whether Direct Access is intended to improve access to care and population health or to reduce costs(2), and whether the movement is based on clinical need.(41) Dentists' have reported concerns over patient safety under the 'Direct Access' initiative.(43)

Regulations outside the control of the GDC restricting DTs' scope of practice in general dental practice (e.g. needing a Practice Group Directive to allow prescribing of prescription-only medications and being able to prescribe but not report upon radiographs) were noted as a barrier to their contribution to the practice and their dependence on input from dentists. Both dentists and DTs in our case studies recommended changing these restrictions to maximise their contribution, freeing up dentist's time and allowing them to provide seamless patient care. Publications from USA and Australia also call for removing restrictions to accessing DTs to meet demands and increase access to underserved populations.(3, 55) Ward states that clinical governance needs to be reconfigured which brings the implementation challenges into sharp focus.(38)

Alongside regulatory factors, intra and interpersonal factors influenced DTs role in practice. Lack of knowledge of DTs' role and their scope of practice were reported in the case studies and in international literature.(53, 68) We note that the influencing factors are not mutually-exclusive and that interactions may occur. For example, while a clear knowledge of DTs' scope of practice was an important factor in including a DT within the team, if the business case were clearer, dentists may be motivated to learn more about the potential contribution of DTs' roles in practice.(4) Again, educational support to increase clarity regarding the role of the DT and how to optimise it may be of benefit to practices.

In Australia, non-metropolitan dentists, those working in multiple surgery practices and those considering expansion were more positive towards delegation.(52) Dutch literature also identified more positive towards delegation from dentists working in larger practices and those with a preventive treatment approach.(69) USA-based papers found younger dentists were more willing to delegate tasks than older dentists.(70) In our case studies, younger associates were reported to be less likely to refer work to DTs, being keen to build their own work. Equally, issues around UDAs and payment for DTs time were deciding factors. Internationally, attitudes towards the DTs' role were noted to influence the amount and type of work referred to them in practice.(71-73) USA-based literature found that the more tasks delegated to DTs, the more patients were seen in practice,(59) and there was higher productivity.(74)

The literature and case studies that we have presented here both reported that carrying out a variety of tasks and feeling valued by the dentist lead to increased DT job satisfaction. Internationally, lack of job satisfaction arising from poor salaries and frustration with the system(75) lead to DTs changing practices or leaving the profession(76). This has implications for the workforce and for practices' business cases – high turnover of staff has implications for stable teamwork and therefore patient care, and replacing and retraining lost staff is costly and takes time away from the practice. There is a clear need for support for practices on the use of teamwork in dental practices. There is an increased focus on preventive work in the UK(77-79), and, in Wales and England, proposed new models of funding provide promising opportunities for DTs.(80-82) Changing professional attitudes and roles may be equally challenging for some, but a teamwork approach to patient-centred oral care will help maintain dental professional standards(1) and meet patient needs. Drawing upon the literature review and case study data and refined following repeated consultations with professionals from the wider sphere of dentistry (government and policy, NHS contracts, practitioners, educators) we have developed materials to help with this process. Based on a the Maturity Matrix Dentistry (MMD)(83), our Skills-Optimisation Self-Evaluation Toolkit (SOSET)(84) is a tutor-facilitated whole team self-evaluation process which is being offered by The Dental Postgraduate Section, Health Education and Improvement Wales (formerly Wales Deanery) as an in-practice 'lunch and learn' exercise. The toolkit allows the whole dental team to critically review how they address skill-mix in delivery of patient-centred oral healthcare in their practice against 'domains' (*Belief in teamwork; Delegation within the team; Team communication; Training; Patients' views on teamwork; Staffing and team management; Premises and equipment* (84)) (and associated criteria) and identify priority areas for improvement.

Conclusion

The issues around funding and payment, policy, and understanding and valuing the role of the DT are international concerns, inherent in some form in many dental services worldwide. Through training and support, dental teams and dentists in particular can enhance their understanding of DTs' role and develop practical processes to facilitate their contribution to patient-centred oral healthcare in general dental practice. Our case studies suggest that making a workable business case was a significant influencing factor in employment of DTs. We acknowledge that this is a major concern for practices that must operate both as businesses and healthcare providers. Policy chance is vital; until funding and regulations ally with DTs scope of practice there will continue to be barriers to full use of their role within the NHS. However, while amended contracts are being piloted, dental teams can be assisted to develop practice-specific ways to optimise the DT role

within the current system. The literature and explored experiences of those working in general dental practices in Wales suggest a place for an educational intervention to address issues impeding DTs role in practice and to enhance all forms of teamwork.

Declaration of interests

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Table 1: Summary of literature on Context, Mechanisms, and Outcomes

External Context (eC): macro factors	Internal Context (iC): meso factors	Mechanisms (M): influencing factors	Potential outcomes (O): as a result of skill- mix
Demand <ul style="list-style-type: none"> - We have an ageing, dentate population with complex oral health needs - Much dentistry is not complex - Demand for dental treatment exceeds capacity Resources <ul style="list-style-type: none"> - There is a good supply of DTs - The funding system Regulation <ul style="list-style-type: none"> - The scope of practice for the DT - The policy impetus supports skill-mix - Direct Access legislation which means DTs don't have to work under the dentists' prescription 	Demand <ul style="list-style-type: none"> - There are a sufficient number of suitable, varied cases for the DTs Resources <ul style="list-style-type: none"> - The practice can make a business case for employing DTs - The GDPs in the practice value the DTs' contribution - There is sufficient surgery space - The practice is well-led Regulation <ul style="list-style-type: none"> - The GDPs in the practice know and understand the scope of practice for DTs 	Resources <ul style="list-style-type: none"> - A payment system that supports appropriate employment of DTs - Experience of working with DTs - The practice having an established referral system to enable DTs get relevant and varied cases - Training the team - Good communication within the practice which facilitates continuity of care - Workplace values & culture (e.g. trust, power-sharing, feeling part of the team) 	Demand <ul style="list-style-type: none"> - Patient oral health needs are met - Patient access to dental care is improved - Population oral health is improved Resources <ul style="list-style-type: none"> - The productivity of the practice increases - System efficiency savings accrue. - The system puts greater emphasis on prevention - DTs undertake diverse work - The GDPs focus on complex cases - Patients are satisfied - Improved staff job satisfaction

Table 2: Original and amended programme theories

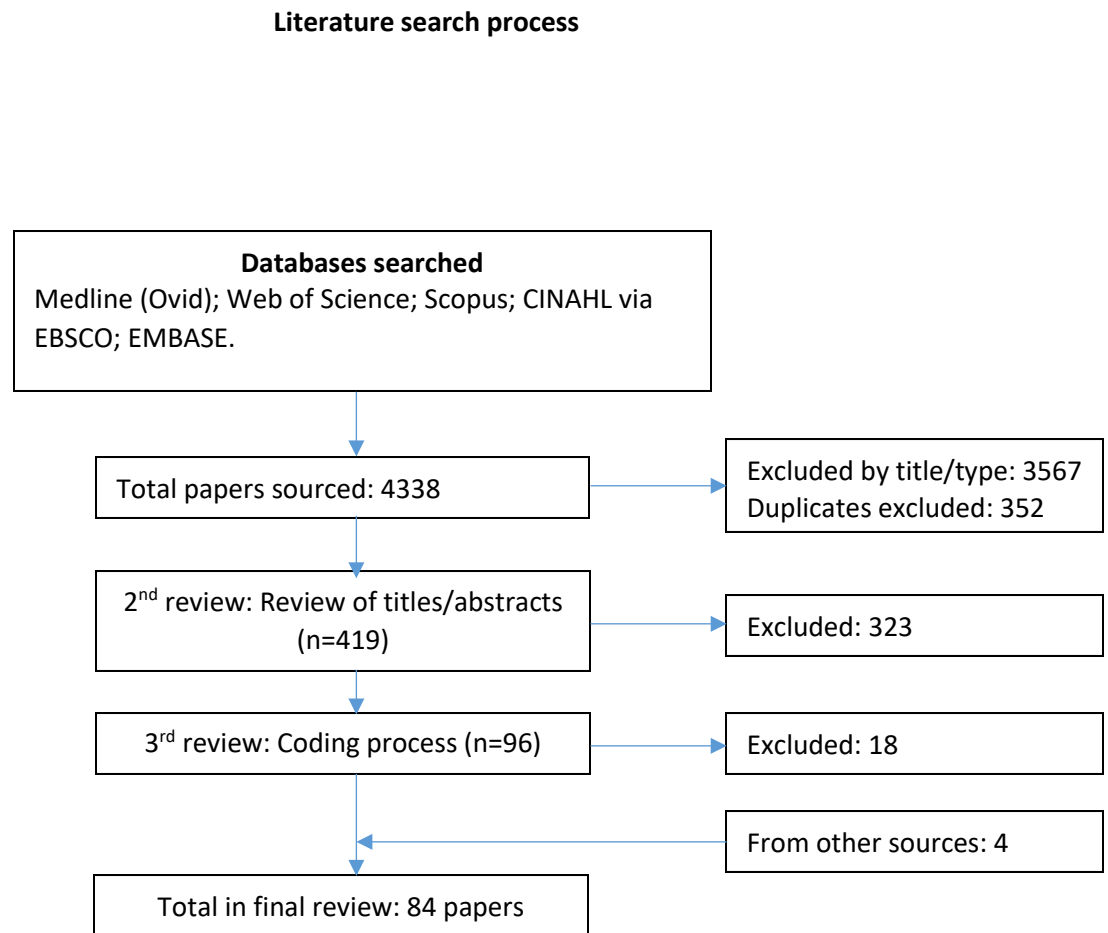
Original theories (derived from a review of the literature)	Amended theories (refined in light of Wales-based case-study interviews)
The Dental Practice as a business	
<i>“A payment system focused on prevention (C) supports employment of DTs (O) by facilitating the business case (M).”</i>	<i>“In practices with a sufficient number of suitable, varied cases for DTs (C), establishing a practice-appropriate, innovative payment system (M) supports full-time employment of DTs (O)”</i>
The Dental Practice as a healthcare provider	
Trust and confidence:	
<i>“Ensuring therapists are appropriately trained (M) enhances trust, confidence and patient safety (O).”</i>	<i>“Whole team training (M) enhances trust, confidence and patient safety (O)”.</i> Additionally, we suggested: <i>“Experience of working with DTs (M) enhances dentists’ trust and confidence in their work (O)”.</i>
Valuing teamwork:	
<i>“A workplace culture that understands and values teamwork (M) improves commitment to teamwork in providing oral health care (O)”</i>	<i>“Establishing a regulatory-appropriate referral system (M) within a workplace culture that understands and values teamwork (M) improves commitment to teamwork in providing oral health care (O).”</i>
Direct Access and regulatory factors:	
<i>“The regulatory context (C) aligned with guidance and policy drivers (M) enables enhanced skill-mix in the general dental service (O)”</i>	<i>“A regulatory context (C) aligned with guidance and policy drivers (M) and a whole team that values Direct Access enables enhanced access to DTs in the general dental service (O)”</i>
Teamwork benefits for patients:	

<i>“Improving patient access and patient care (M) improves patient satisfaction with their care (O)”</i>	No amendments
Improved patient access to care:	
<i>“Improving patient access and patient care (M) improves patient oral health (I)”</i>	No amendments
The Dental Practice as a workplace	
<i>“Dentists adopting a leadership role (M) and ensuring DTs carrying out a varied workload, working to their full scope of practice (M) improves job satisfaction (O).”</i>	<i>“Team members carrying out a varied workload, appropriate to their level of training (M) improves job satisfaction (O).”</i>

Site	DT	Staff in case study site	% NHS
1	No	2 Principal dentists, 7 dental nurses, 1 associate, 1 Foundation dentist, 1 receptionist, 1 practice manager	91%
2	No	2 Principals, 1 associate, 5 dental nurses, 1 practice manager, 1 receptionist	99%
3	No	4 Dentists, 5 dental nurses, 2 receptionists, 1 Dental hygienist/therapist (1 day a week), 1 practice manager	100%
4	Yes	1 Principal, 1 associate dentist, 2 Dental hygienist/therapists, 5 dental nurses, Head dental nurse, 1 practice manager	46%
4	Yes	1 Principal, 1 Dental hygienist/therapist, 1 associate (full-time), 2 associates (part-time), 1 orthodontist (part-time), 4 dental nurses, 1 practice manager	89%
6	Yes	1 Principal, 2 Dental hygienist/therapist, 1 Dental hygienist, 4 associates, 8 dental nurses	94%

Table 3: Case study sites overview

Figure 1: Literature search process



Keywords:

Dental therapist
Dent* AND skill mix
Dent* AND dental care professionals
Dent* AND Direct Access
Dent* AND (delegation OR substitution)
Dent* AND teamwork
Dent* AND team work

Inclusion criteria:

English language; published post-1993

Exclusion criteria:

Promotional articles; letters; study protocols; opinion pieces/editorials; no clear DT focus; evaluation of educational courses; interprofessional education; appliance design.